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NATIONAL DAM INSPECTION PROGRAM. HEILMAN DAM (NDI NUMBER PA-006--ETC(U)
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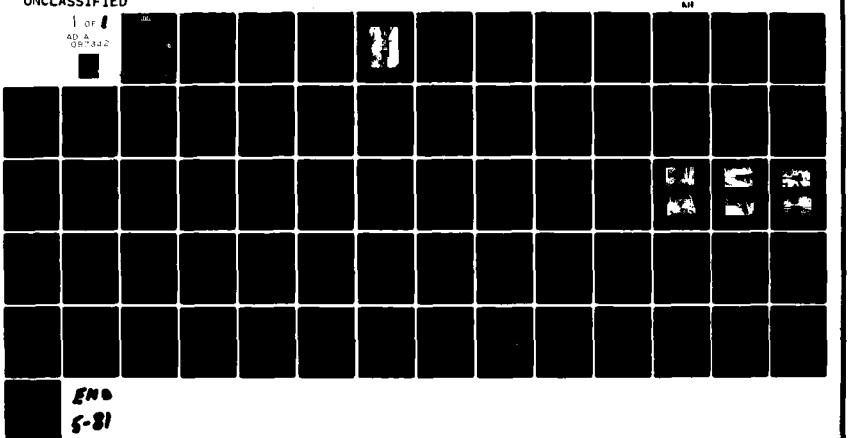

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LEVEL II

AD A097342

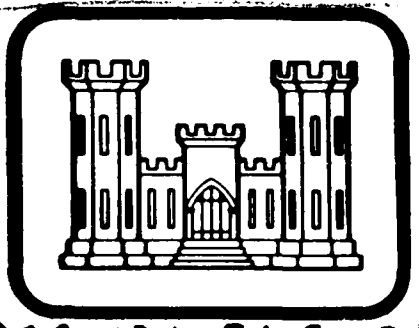
(6) National Dam Inspection Program.

DELAWARE RIVER BASIN
HEILMAN DAM
BOROUGH OF LEHIGHTON

(NDI NO. PA-00612,
DER NO. 13-005), Delaware River Basin

CARBON COUNTY, PENNSYLVANIA.
PHASE I INSPECTION REPORT,
NATIONAL DAM INSPECTION PROGRAM.

(15) DACW31-81-C-0013



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PREPARED FOR

DEPARTMENT OF THE ARMY

Baltimore District, Corps of Engineers

Baltimore, Maryland 21203

(17) Hendrik Jongsma

BY

Berger Associates

Harrisburg, Pennsylvania 17105

(11) FEBRUARY 1981

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PREFACE

This report has been prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITIONS AND RECOMMENDATIONS

Name of Dam: HEILMAN DAM

State & State No.: PENNSYLVANIA, 13-005

County: CARBON

Stream: MAHONING CREEK

Date of Inspection: October 22, 1980

Based on the visual inspection, past performance and the available engineering data, the dam and its appurtenant structures appear to be in poor condition.

In accordance with the Corps of Engineers' evaluation guidelines, the size classification of this dam is small and the hazard classification is significant. These classifications indicate that the Spillway Design Flood (SDF) should be in the range of the 100 year flood to one-half the Probable Maximum Flood (PMF). The recommended SDF for this structure is the 100 year flood. The spillway capacity is not adequate for passing the SDF peak inflow without overtopping the dam. The spillway is considered to be inadequate, but not seriously inadequate.

~~The following~~ recommendations ~~are~~ presented for immediate action by the owner:

1. That measures shall be taken to provide an adequate spillway capacity, which shall include the raising of the embankment profile to at least the design crest elevation.
2. That the embankment be cleared of all trees, brush and weeds under the direction of a professional engineer, experienced in the design and construction of earthfill dams.
3. That access above the floodplain be provided for surveillance.
4. That either a method be developed for opening the sluice gate in an emergency or the opening be permanently closed off.

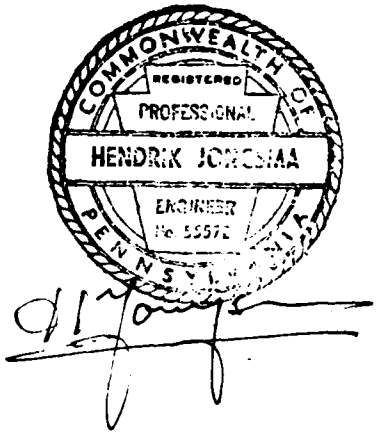
5. That a formal surveillance and downstream warning system be developed for use during periods of high or prolonged rainfall.

6. That an operation and maintenance manual be prepared for guidance in the operation of the dam during normal and emergency conditions, and that a schedule be developed for the annual inspection of the dam and its appurtenant structures. The operational manual shall include regular maintenance of the embankment.

SUBMITTED BY:

BERGER ASSOCIATES, INC.
HARRISBURG, PENNSYLVANIA

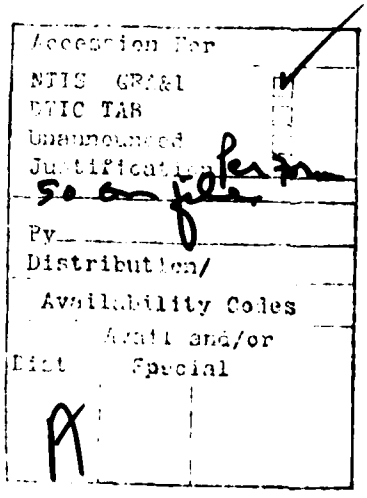
DATE: February 9, 1981

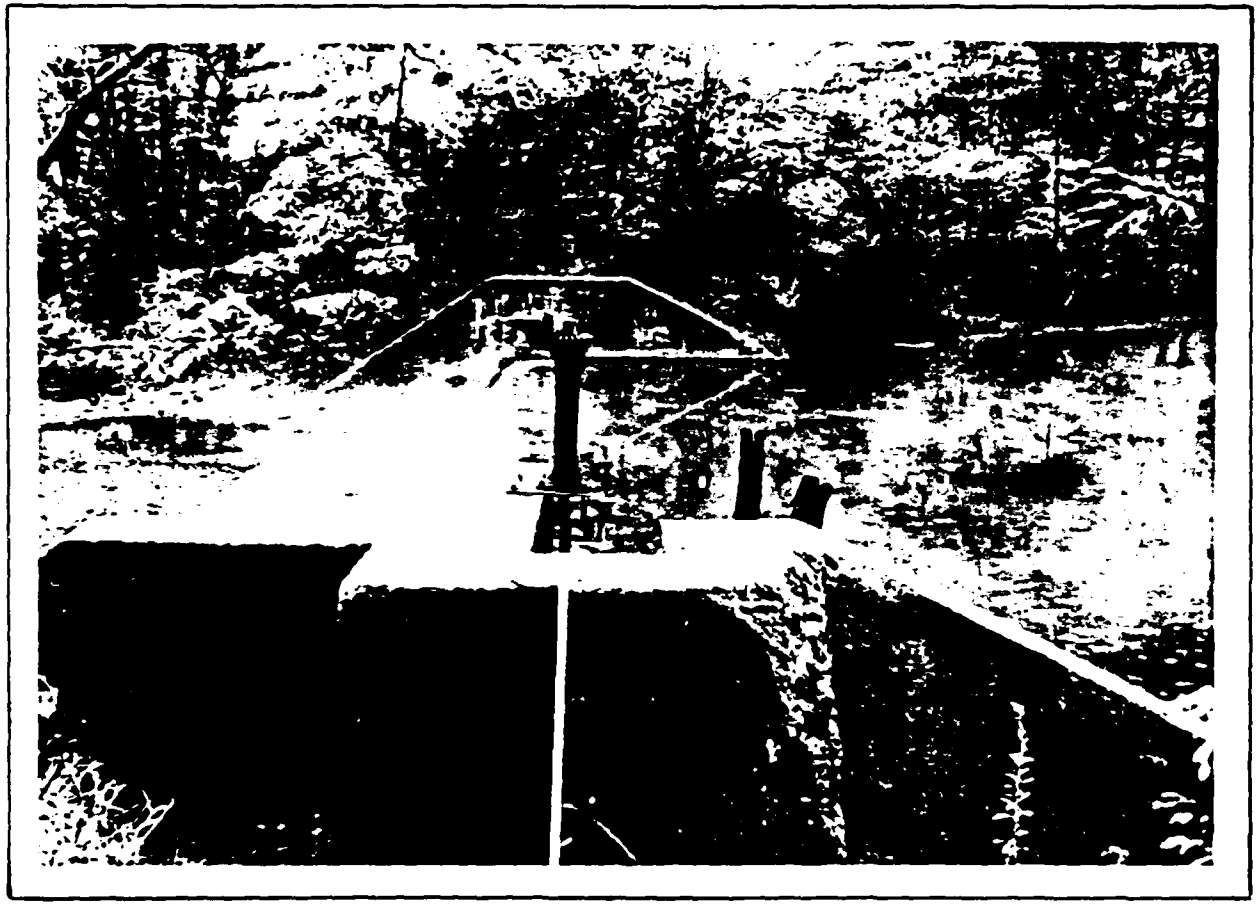


APPROVED BY:

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

DATE: 4 March 81





OVERVIEW

HEILMAN DAM

Photograph No. 1

TABLE OF CONTENTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

HEILMAN DAM

NDI-ID NO. PA-00612
DER-ID NO. 13-005

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

A. Authority

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspections of dams throughout the United States.

B. Purpose

The purpose of this inspection is to determine if the dam constitutes a hazard to human life and property.

1.2 DESCRIPTION OF PROJECT

A. Description of Dam and Appurtenances

Heilman Dam is a concrete weir in the Mahoning Creek with a low earthfill embankment on each side. The concrete weir is 125 feet long and is at an elevation 7 feet below the design crest elevation of the embankment. The right embankment is 125 feet long and the left embankment is about 150 feet long. The left abutment wall of the spillway contains an inoperable sluice gate as a drawdown facility. The reservoir was used as a water supply for the nearby Lehigh Valley Railroad Company facilities. A 16-inch intake pipe is located adjacent to the sluice gate. The present condition and control facilities on this pipe are unknown.

B.	Location:	Borough of Lehighton, Carbon County U.S.G.S. Quadrangle - Lehighton, PA Latitude 40°-49.5', Longitude 75°-42.3' Appendix E, Plates I & II
C.	Size Classification:	Small: Height - 15 feet Storage - 117 acre-feet
D.	Hazard Classification:	Significant (Refer to Section 3.1.E.)

E. Ownership: Borough of Lehighton
Mr. Mortimer L. Smedley
Borough Manager
Municipal Building
Lehighton, PA 18235

F. Purpose: Recreation

G. Design and Construction History

A permit to rebuild the Old Facing Mill Dam at this site was issued to the Lehigh Valley Railroad Company on February 26, 1914. Construction was to be in accordance with the plans as shown on Plate III, Appendix E. A letter, dated May 26, 1914, from the owner to the Water Supply Commission requested a change in foundation elevation. The excavation showed that the foundation could be two feet higher. The downstream crib was raised two feet, providing a downstream pool two feet higher. The top of spillway and the embankment were maintained at the original elevation. The concrete weir section was reduced two feet in height.

H. Normal Operating Procedures

Requests were made to lower the pool in 1939, 1940 and 1946 to remove siltation in the reservoir. On April 26, 1951, ownership of the dam was transferred to the Borough of Lehighton. All inflow is discharged over the spillway and there are no operating procedures at the present time.

1.3 PERTINENT DATA

A. Drainage Area (square miles)

From files:	39.1
Computed for this report:	38.5
Use:	38.5

B. Discharge at Dam Site (cubic feet per second)
See Appendix D for hydraulic calculations.

Maximum known flood (estimated from records of U.S.G.S. gage on nearby Wild Creek).	4582
Outlet works at normal pool Elev. 456.0	172
Outlet works at low pool Elev. 453.5	122
Spillway capacity at pool Elev. 458.9 (low point of dam)	2037

Spillway capacity at design crest Elev. 463.0	7640

C. Elevation (feet above mean sea level)

Top of dam (low point)	458.9
Top of dam (design crest)	463.0
Spillway crest	456.0
Upstream portal invert	449.0
Downstream portal invert	449.0
Streambed at downstream toe of dam (estimate)	448.0

D. Reservoir (miles)

Length of normal pool (Elev. 456.0)	.6
Length of maximum pool (Elev. 458.9)	.7

E. Storage (acre-feet)

Spillway crest (Elev. 456.0)	76.7
Top of dam (Elev. 458.9)	117

F. Reservoir Surface (acres)

Spillway crest (Elev. 456.0)	4.6
Top of dam (Elev. 458.9)	29.9

G. Dam

Refer to Plate III in Appendix E for plan and section.

Type: Earthfill.

Length: 385 feet, including 125 foot long spillway.

Height: 15 feet.

Top Width: Design - 12 feet; Survey - 8 feet.

Side Slopes:

	Design	Surveyed
Upstream	2H to 1V	2.5H to 1V
Downstream	1.5H to 1V	2.5H to 1V

Zoning: None.

Cutoff: None.

Grouting: None.

H. Outlet Facilities

Type: 4 feet x 4 feet sluiceway closed with a 48-inch sluice gate.

Inlet: Elevation 449.0.

Location: Left spillway abutment.

I. Spillway

Type: Concrete broad crested weir.

Length of Weir: 125 feet.

Crest Elevation: 456.0

Location: *Center of dam.*

J. Regulating Outlets

See Section 1.3.H. above.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

A. Hydrology & Hydraulics

Engineering data on the hydrologic and hydraulic design for the Long Run Reservoir No. 1 Dam are not available. The dam was designed and constructed prior to the requirements for a permit. The files of the Pennsylvania Department of Environmental Resources (PennDER) indicate a drainage area of 2.7 square miles. The spillway has a design width of thirty feet, and the design crest is three feet below the top of dam (Plate III, Appendix E).

B. Embankment and Appurtenant Structures

Design data for the embankment and appurtenant structures are not available, except two drawings indicating typical sections and elevation of the reconstruction in 1911 and 1914 (Plates III & IV, respectively, Appendix E).

2.2 CONSTRUCTION

Available construction data is limited to five Progress Reports by PennDER during the reconstruction of the dam in 1914. These reports indicate that serious leakage occurred after the dam was increased in height in 1911. This leakage was noticeable at both abutments and near the valve house. Plans were submitted for remedial measures in 1914 and were approved on June 23, 1914. These plans indicate a trench excavation along the upstream toe. The trench was to be filled with concrete. The face of the wall was to be sealed with a one foot thick facing over the upper part of the wall. Additional fill was obtained from the upstream end of the reservoir and placed on the downstream embankment.

The construction reports indicate that the trench was excavated to a depth varying from 5 to 12 feet into a red sandstone or shale. Fissured sandstone in the south (left) abutment was grouted through pipes placed in the concrete cutoff wall. The trench excavation revealed that the original dam was placed on a gravel and sand mixture layer over the shale varying in depth from one to five feet. Construction was stopped in November, 1914, and was not completed until 1919. The cutoff wall was made at least two feet thick, and the wall facing was anchored into the old wall.

Letters indicate that the spillway deteriorated seriously in the 1930's and that spillway walls and slab were repaired in 1941. The cement mortar slab showed deterioration again in 1946.

C. Operating Records

Operating records, including maximum pool levels, have not been maintained by the owner.

D. Post Construction Changes

The visual inspection does not indicate that post construction changes have been made.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

A. General

The general appearance of Heilman Dam is poor. The concrete spillway weir has deteriorated, exposing the aggregate. This condition does not affect the structural integrity at the present time. The embankments show signs of no maintenance and are overgrown with trees and brush. Considerable erosion adjacent to the spillway abutment walls has occurred.

The visual inspection check list and sketches of the general plan and profile of the dam, as surveyed during the inspection, are presented in Appendix A of this report. The Borough Manager, Mr. Mort Smedley, accompanied the inspectors during the field inspection.

Photographs taken on the day of inspection are reproduced in Appendix C.

B. Embankment

The embankment fills at each side of the spillway weir have not been maintained during the recent years. They are overgrown with trees and brush (Photographs No. 2 and No. 3). The embankment profile on Plate A-II, Appendix A, indicates that a considerable length of the embankment is below the design crest elevation, with deep erosions (up to 4 feet) adjacent to the spillway abutment walls. The downstream slopes at Sta. 0+30 are flatter than the design slopes. There were no signs of upstream slope protection.

C. Appurtenant Structures

The spillway is located in the center of the dam and has a length of 125 feet. All inflow is discharged over the weir. The concrete of the weir has exposed aggregate, but there were no signs of cracks or structural instability. A constant flow over the weir and the downstream pool prevented close observation. Downstream from the weir is a submerged timber cribbing filled with stone.

The weir has concrete abutments at each side. The left abutment contains a 4' x 4' opening, closed with a sliding gate. The gate stand and stem are broken and the gate is inoperable at the present time.

Debris prevented observation of the upstream end of a 16-inch outlet pipe located adjacent to the gate. Present owners are not familiar with this outlet, which originally supplied water to the nearby railroad yards.

D. Reservoir Area

The reservoir is for a large part filled with sedimentation and considerable weed growth is in evidence. The reservoir is used for fishing and the reported depth varies, with a maximum of five or six feet. There are no upstream reservoirs located in the drainage basin.

E. Downstream Channel

The immediate downstream channel is wide and flat with only a small vertical drop. About 500 feet downstream from the dam is the Borough Sewage Treatment Plant. This plant is located in the floodplain and has been "floodproofed" with the necessary closure features. Immediately downstream from the plant is a four arch stone bridge carrying the railroad over the valley. Each arch opening is 17.5 feet wide and 11.5 feet high. The Mahoning Creek joins the Lehigh River immediately downstream of the railroad bridge. The limited openings in this bridge and the high railroad embankment would prevent a hazard further downstream.

Due to the presence of the sewage treatment plant, the hazard category for Heilman Dam is considered to be "significant."

3.2 EVALUATION

The overall visual evaluation of Heilman Dam indicates that the dam is in poor condition. It is recommended that all trees and brush be removed from the embankment. A protective cover should be provided on the embankment to prevent erosion.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

Operational procedures for Heilman Dam do not exist at the present time. All inflow is discharged over the spillway.

4.2 MAINTENANCE OF EMBANKMENT

Trees and brush have been permitted to grow on the embankment and there are no indications of recent maintenance. The embankment has settled and/or eroded, lowering the profile below its design crest elevation (top of spillway abutments). An increase of three feet above the normal pool elevation would cause overtopping.

4.3 MAINTENANCE OF OPERATING FACILITIES

The only operating facility is a four foot sluice gate for drawdown. This gate is in the closed position, and is inoperable due to a broken stem and gate stand.

4.4 WARNING SYSTEM

There is no formally organized surveillance and downstream warning system in existence at the present time.

4.5 EVALUATION

There are no operational procedures for Heilman Dam at the present time. It is recommended that procedures be developed to include regular maintenance of the embankment and operation of the sluice gate. A formal surveillance and downstream warning system should be developed for implementation during periods of high or prolonged rainfall. An access road located above the floodplain elevation should be provided for this surveillance.

SECTION 5 - HYDROLOGY/HYDRAULICS

5.1 EVALUATION OF FEATURES

A. Design Data

The hydrologic and hydraulic analysis available from PennDER for Heilman Dam was not very extensive. No area-capacity curve, frequency curve, unit hydrograph, design storm, design flood hydrograph, or flood routings were available.

B. Experience Data

There are no records of flood levels at Heilman Dam. Based on records of the U.S.G.S. stream gage on Wild Creek at nearby Hatchery, Pennsylvania, the maximum inflow to Heilman Dam is estimated to be 4582 cfs. This flood was passed without reported difficulties.

C. Visual Observations

It was noted that the 48-inch gate on the sluiceway was inoperable. No other condition were observed that would indicate that the appurtenant structures of the dam could not operate satisfactorily during a flood event until the dam is overtopped.

D. Overtopping Potential

Heilman Dam has a total storage capacity of 117 acre-feet and the overall height is 15 feet above the streambed. These dimensions indicate a size classification of "small." The hazard classification for this dam is "Significant" (see Section 3.1.E.).

The Spillway Design Flood (SDF) for a dam having the above classifications should be in the range of the 100 year flood to one-half the Probable Maximum Flood (PMF). Since the downstream area is not populated, the recommended SDF for this dam is the 100 year flood. For this dam the SDF peak inflow is 7,886 cfs (see Appendix D for hydraulic calculations).

Comparison of the estimated SDF peak inflow of 7,886 cfs with the estimated total discharge capacity of 2037 cfs indicates that a potential for overtopping of the Heilman Dam exists.

An estimate of the storage effect of the reservoir and routing of the computed inflow hydrograph through the reservoir shows that this dam does not have the necessary storage available to pass the SDF without overtopping. The spillway-reservoir system passes the SDF with about

4.1 feet of overtopping based on the present low point in the crest profile. If the crest would be made uniform at the design elevation of 463, the project would pass the SDF with about 0.1 foot of overtopping.

E. Spillway Adequacy

The small size and significant hazard categories, in accordance with the Corps of Engineers criteria and guidelines, indicates that the SDF for this dam should be in the range of the 100 year flood to one-half PMF. The recommended SDF is the 100 year flood.

Calculations show that the total spillway discharge capacity and reservoir storage capacity, based on the present low point of the dam profile, cannot pass the SDF without overtopping to a depth of about 4.1 feet at the low point in the dam (refer to Appendix D).

Since the total spillway discharge and reservoir storage capacity cannot pass the SDF without overtopping, and since the dam is not classified as high hazard, the spillway is considered to be inadequate but not seriously inadequate.

The hydrologic analysis for this investigation was based upon existing conditions of the watershed. The effects of future development were not considered.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

A. Visual Observations

1. Embankment

The visual inspection of Heilman Dam did not detect any signs of embankment instability. The field survey indicates that the slopes are flatter than the proposed slopes on the design drawings. The profile of the dam indicates that the crest is uneven with very low points near the abutments of the spillway.

2. Appurtenant Structures

The concrete weir is 66 years old and shows signs of deterioration. Aggregate has been exposed. However, there are no signs of structural instability. The drawdown sluice gate is not operable.

B. Design and Construction Data

1. Embankment

The design data for the embankment is limited to one cross section on Plate III, Appendix A. The existing embankment at the site was incorporated in the design of the present dam. The centerline of the dam was moved 12 feet downstream, which means that the old dam is located at the upstream side. Photographs indicate that riprap was placed on the upstream side. Visual inspection did not detect this protection and the slope is flatter than the designed slope.

2. Appurtenant Structures

The design drawing indicates a construction height of 12.5 feet for the weir. PennDER files indicate that the footing elevation was raised two feet, giving a structural height of 10.5 feet. The base width is shown as 9.83 feet.

C. Operating Records

Operating records for this dam have not been maintained by the owners. There are no indications of stability problems.

D. Post Construction Changes

There are no records of changes to the embankment or its appurtenant structures.

E. Seismic Stability

This dam is located in Seismic Zone 1, and it is considered that the static stability is sufficient to withstand minor earthquake-induced dynamic forces. No studies or calculations have been made to confirm this assumption.

SECTION 7 - ASSESSMENT AND RECOMMENDATIONS

7.1 DAM ASSESSMENT

A. Safety

The visual inspection and the review of the construction drawings indicate that Heilman Dam is in poor condition. The dam has been constructed in accordance with acceptable engineering practices. The field inspection did not detect any signs of instability. The crest profile of the dam is irregular and below design crest elevation. The trees and brush growth on the embankment is detrimental to the safety of the embankment.

The hydrologic and hydraulic computations indicate that the combination of storage capacity and the spillway discharge capacity are not able to pass the SDF without overtopping the dam. The spillway is considered inadequate but not seriously inadequate.

B. Adequacy of Information

The design information contained in the files combined with the visual inspection are considered sufficiently adequate for making a reasonable assessment of this dam.

C. Urgency

The recommendations pesented below should be implemented immediately.

D. Additional Studies

Additional investigations are required to determine measures necessary to provide an adequate spillway capacity unless the crest of the dam is restored to its original design crest elevation.

7.2 RECOMMENDATIONS

In order to assure the continued satisfactory operation of this dam, the following recommendations are presented for immediate implementation by the owner:

1. That measures shall be taken to provide an adequate spillway capacity, which shall include the raising of the embankment profile to at least the design crest elevation.

2. That the embankment be cleared of all trees, brush and weeds under the direction of a professional engineer, experienced in the design and construction of earthfill dams.

3. That access above the floodplain be provided for surveillance.

4. That either a method be developed for opening the sluice gate in an emergency or the opening be permanently closed off.

5. That a formal surveillance and downstream warning system be developed for use during periods of high or prolonged rainfall.

6. That an operation and maintenance manual be prepared for guidance in the operation of the dam during normal and emergency conditions, and that a schedule be developed for the annual inspection of the dam and its appurtenant structures. The operational manual should include regular maintenance of the embankment.

APPENDIX A

CHECK LIST OF VISUAL INSPECTION REPORT

CHECK LIST

PHASE I - VISUAL INSPECTION REPORT

PA DER # 13-005 NDI NO. PA-00 612

NAME OF DAM Heilman Dam HAZARD CATEGORY *Significant*

TYPE OF DAM Concrete weir with short embankment sections at both sides.

LOCATION Borough of Lehighton ~~TOWNSHIP~~ Carbon COUNTY, PENNSYLVANIA

INSPECTION DATE 10/22/80 WEATHER Clear, Sunny TEMPERATURE 40-50°

INSPECTORS: R. Houseal (Recorder) OWNER'S REPRESENTATIVE(s):

H. Jongsma Mort Smedley

R. Shireman Clint Williams

A. Bartlett

NORMAL POOL ELEVATION: 456.0 AT TIME OF INSPECTION:

BREAST ELEVATION: 463.0 (Design) POOL ELEVATION: 456.+

SPILLWAY ELEVATION: 456.0 TAILWATER ELEVATION: 448.3

MAXIMUM RECORDED POOL ELEVATION:

GENERAL COMMENTS:

The dam appears to be in poor condition. Concrete spillway is weathered so that the aggregate is exposed over the entire visible surface. The embankment abutments with the concrete spillway are severely eroded. The embankment behind the spillway walls is about 4 feet below the top of the wall.

The embankment portions of the dam, both left and right, have trees and brush growing on upstream and downstream slopes.

NDI NO. PA-00612

VISUAL INSPECTION
EMBANKMENT

	OBSERVATIONS AND REMARKS
A. SURFACE CRACKS	None detectable.
B. UNUSUAL MOVEMENT BEYOND TOE	None observed.
C. SLOUGHING OR EROSION OF EMBANKMENT OR ABUTMENT SLOPES	None observed. Tree growth on upstream and downstream slopes, also brush. Abutments with spillway are eroded.
D. ALIGNMENT OF CREST: HORIZONTAL: VERTICAL:	Horizontal appears good. Vertical - refer to profile Plate A-II.
E. RIPRAP FAILURES	Riprap not visible.
F. JUNCTION EMBANKMENT & ABUTMENT OR SPILLWAY	Abutments with spillway walls are eroded to about 4 feet below top of wall. Abutments with natural ground appear to be sound.
G. SEEPAGE	None observed.
H. DRAINS	None.
J. GAGES & RECORDER	None.
K. COVER (GROWTH)	Trees, brush and weeds over entire embankment.

NDI NO. PA-00612

VISUAL INSPECTION
OUTLET WORKS

	OBSERVATIONS AND REMARKS
A. INTAKE STRUCTURE	None.
B. OUTLET STRUCTURE	None.
C. OUTLET CHANNEL	N/A.
D. GATES	48" slide gate inoperable. Gate stand and stem broken.
E. EMERGENCY GATE	N/A.
F. OPERATION & CONTROL	N/A.
G. BRIDGE (ACCESS)	N/A.

NDI NO. PA-00612

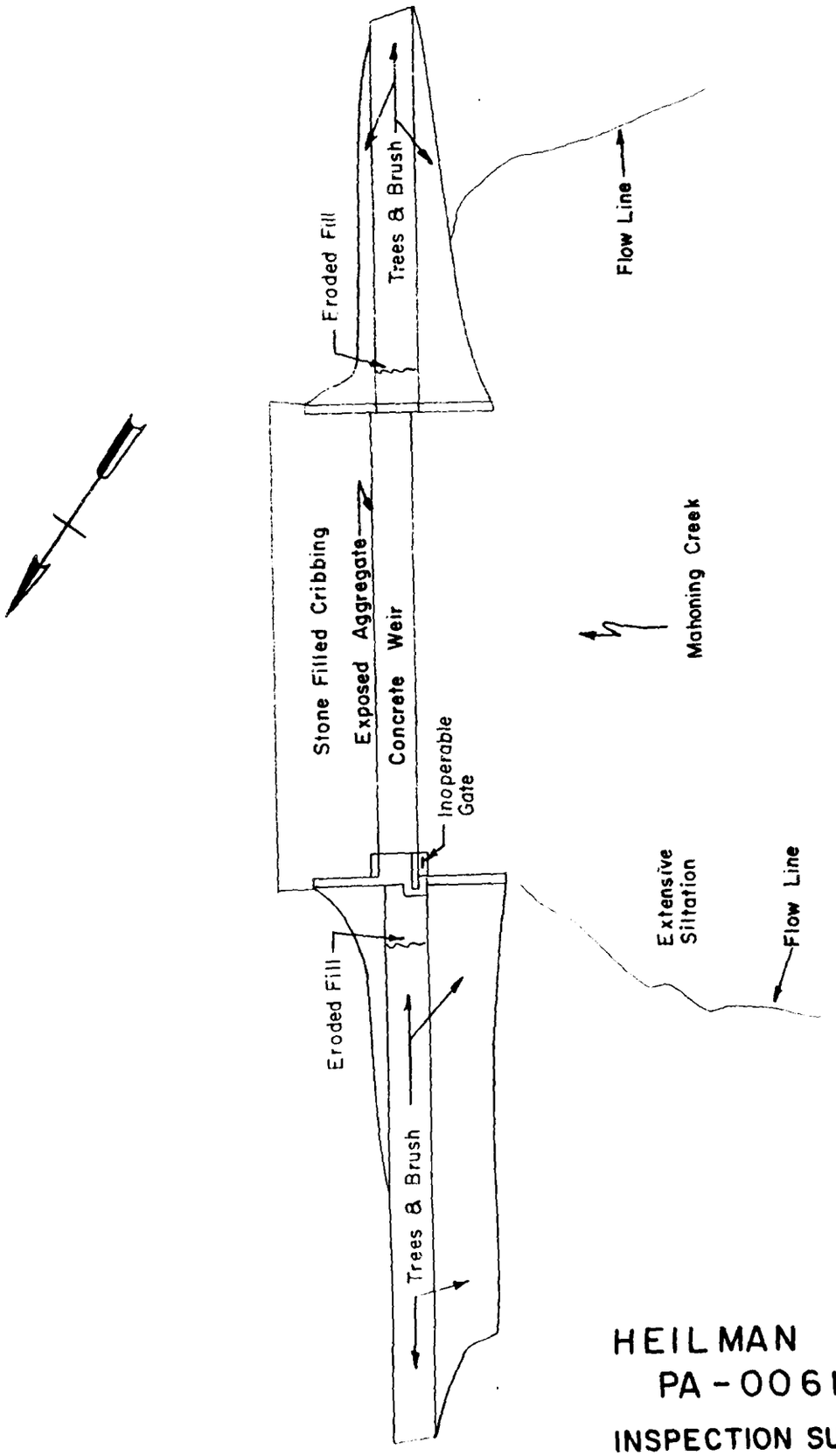
VISUAL INSPECTION
SPILLWAY

	OBSERVATIONS AND REMARKS
A. APPROACH CHANNEL	The dam spans the width of creek forming a ponded area upstream from the weir and embankment. All stream flow passed directly over the weir.
B. WEIR: Crest Condition Cracks Deterioration Foundation Abutments	Crest and entire surface is weathered. Structure appears to be sound otherwise.
C. DISCHARGE CHANNEL: Lining Cracks Stilling Basin	The channel below the weir is the continuation of the stream and is made up of rocky bottom and flat overbanks with moderate tree growth and brush. The stilling basin is a timber cribbing filled with stone.
D. BRIDGE & PIERS	None.
E. GATES & OPERATION EQUIPMENT	One slide gate is located at the left end of the weir. The lift control is badly damaged. The gate cannot be operated.
F. CONTROL & HISTORY	The dam was acquired by the Borough in the 1950's. There is no plan of operation or maintenance.

NDI NO. PA-00 612

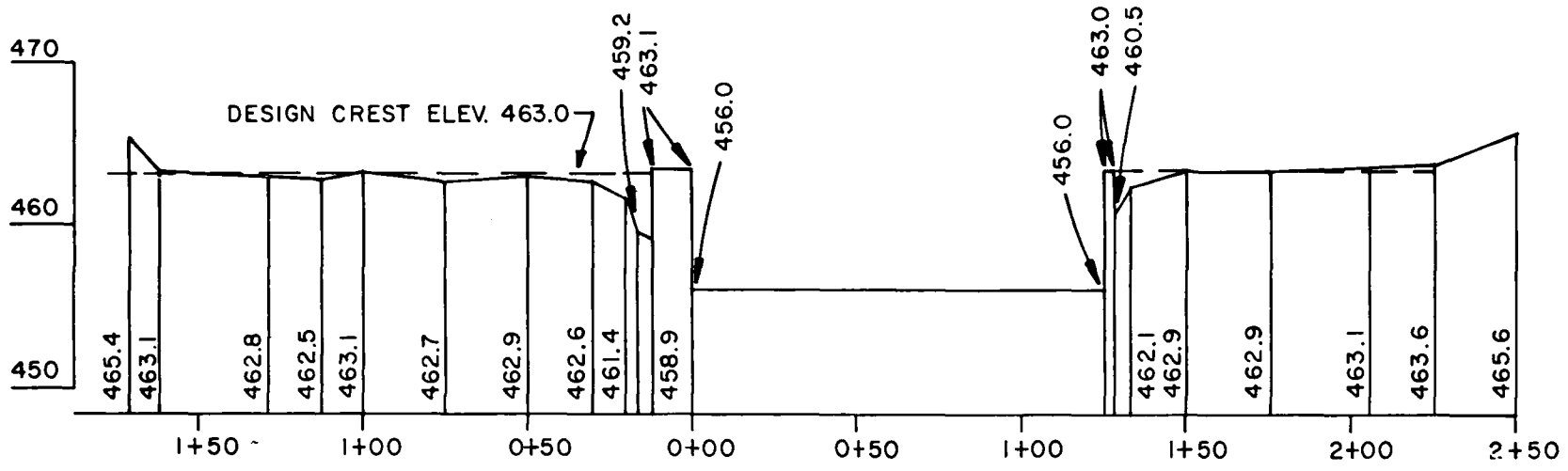
VISUAL INSPECTION

	OBSERVATIONS AND REMARKS
INSTRUMENTATION Monumentation	None.
Observation Wells	None.
Weirs	None.
Piezometers	None.
Staff Gauge	None.
Other	None.
RESERVOIR Slopes	Mountainside on right. Left side flat.
Sedimentation	Sediment upstream from the spillway is heavy. The Borough is seeking federal help to clear the creek.
Watershed Description	Mostly wooded and farmland.
DOWNSTREAM CHANNEL Condition	Natural stream.
Slopes	Woodlands and highway.
Approximate Population	Sewage Treatment Plant, R.R. Bridge.
No. Homes	None.

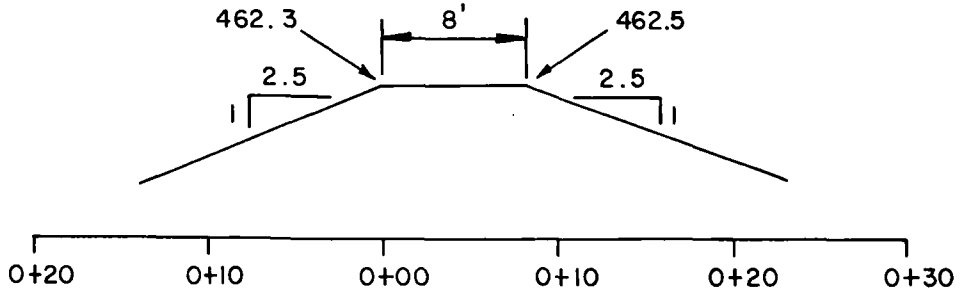


HEILMAN DAM
PA-00612
INSPECTION SURVEY
PLATE A-I

SURVEYED 10-22-80



EMBANKMENT PROFILE



EMBANKMENT SECTION
STA. 0+30 LT.

SURVEYED 10-22-80

HEILMAN DAM
PA-00612
INSPECTION SURVEY
PLATE A-II

APPENDIX B

CHECK LIST OF ENGINEERING DATA

CHECK LIST
ENGINEERING DATA

PA DER # 13-005 NDI NO. PA-00612

NAME OF DAM Heilman Dam

ITEM	REMARKS
AS-BUILT DRAWINGS	Not available.
REGIONAL VICINITY MAP	U.S.G.S. Quadrangle - Lehighton, Pa. See Plate II, Appendix E
CONSTRUCTION HISTORY	Dam constructed in 1914-1915 by Lehigh Valley Railroad Company at the site of an existing mill dam. Concrete spillway was founded 2 feet above elevation shown on plans.
GENERAL PLAN OF DAM	Plate III, Appendix E.
TYPICAL SECTIONS OF DAM	Plate III, Appendix E.
OUTLETS: PLAN DETAILS CONSTRAINTS DISCHARGE RATINGS	Plate III, Appendix E. 4'-0" x 4'-0" opening in left abutment with sluice gate.

NDI NO. PA-00612

ENGINEERING DATA

ITEM	REMARKS
RAINFALL & RESERVOIR RECORDS	No records.
DESIGN REPORTS	None.
GEOLOGY REPORTS	None.
DESIGN COMPUTATIONS: HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None.
MATERIALS INVESTIGATIONS: BORING RECORDS LABORATORY FIELD	None.
POST CONSTRUCTION SURVEYS OF DAM	None.
BORROW SOURCES	Unknown.

ENGINEERING DATA

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	None.
HIGH POOL RECORDS	Unknown.
POST CONSTRUCTION ENGINEERING STUDIES & REPORTS	None.
PRIOR ACCIDENTS OR FAILURE OF DAM Description: Reports:	None.
MAINTENANCE & OPERATION RECORDS	No records.
SPILLWAY PLAN, SECTIONS AND DETAILS	Plate III, Appendix E.

ENGINEERING DATA

ITEM	REMARKS
OPERATING EQUIPMENT, PLANS & DETAILS	One unoperable gate.
CONSTRUCTION RECORDS	None, except photographs in PennDER files.
PREVIOUS INSPECTION REPORTS & DEFICIENCIES	Some letters from PennDER indicating settlement or erosion of fill adjacent to spillway. Trees and brush reported since 1925.
MISCELLANEOUS	

NDI NO. PA-00612

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 40% woodland, 60% farmland

ELEVATION:

TOP NORMAL POOL & STORAGE CAPACITY: Elev. 456 Acre-Feet 76.7

TOP FLOOD CONTROL POOL & STORAGE CAPACITY: Elev. 458.9 Acre-Feet 117

MAXIMUM DESIGN POOL: Elev. 463

TOP DAM: Elev. 458.9

SPILLWAY:

a. Elevation 456

b. Type Concrete broad crested weir.

c. Width 125

d. Length ---

e. Location Spillover Center of dam.

f. Number and Type of Gates None.

OUTLET WORKS:

a. Type 4' x 4' sluiceway.

b. Location Left of spillway.

c. Entrance inverts 449

d. Exit inverts 449

e. Emergency drawdown facilities 48" gate.

HYDROMETEOROLOGICAL GAGES:

a. Type None.

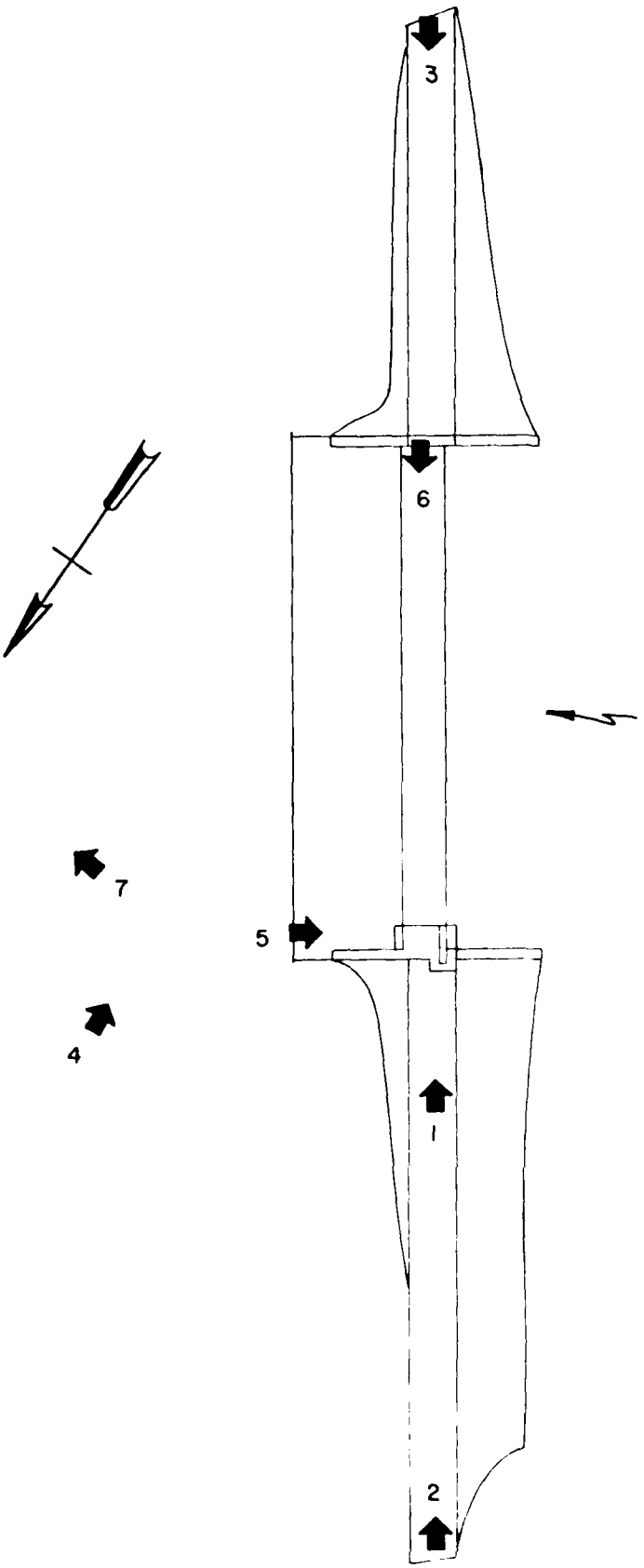
b. Location

c. Records

MAXIMUM NON-DAMAGING DISCHARGE: 2037 cfs.

APPENDIX C

PHOTOGRAPHS



HEILMAN DAM

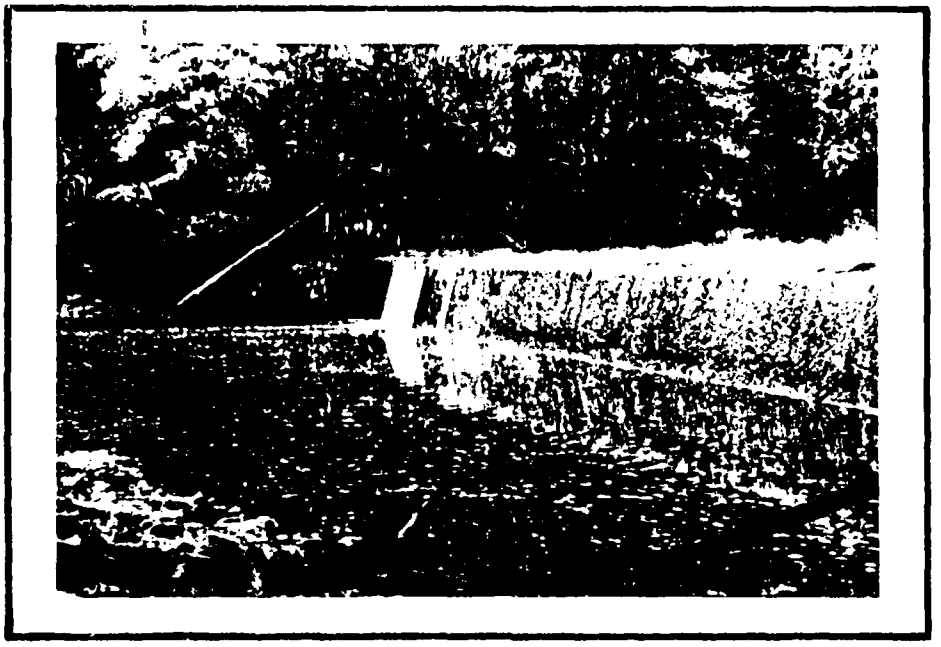
PA-00612

KEY MAP OF PHOTOGRAPHS

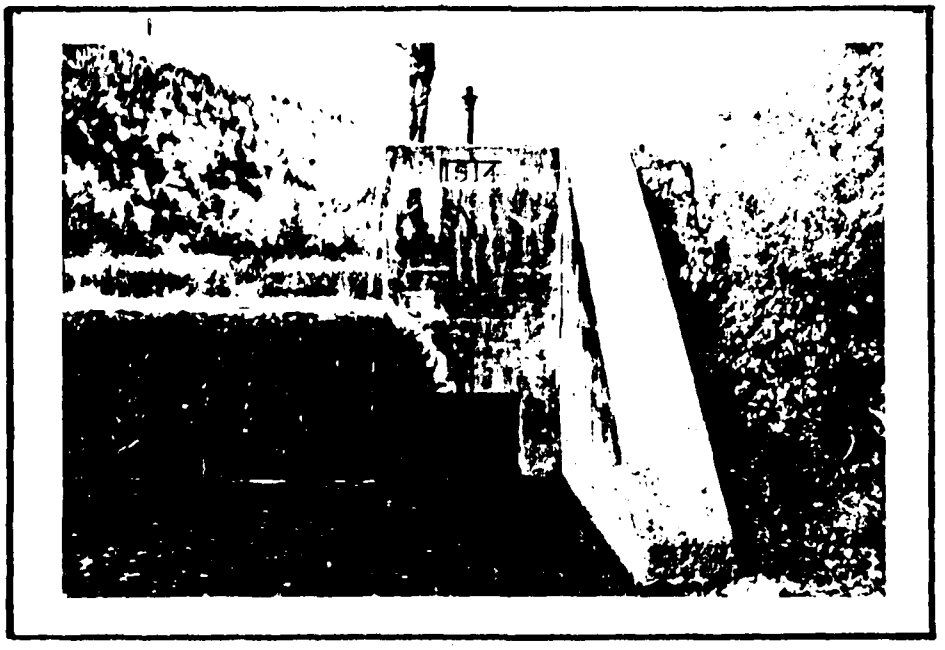
PLATE C-1

LEFT EMBANKMENT FROM LEFT ABUTMENT - NO. 2

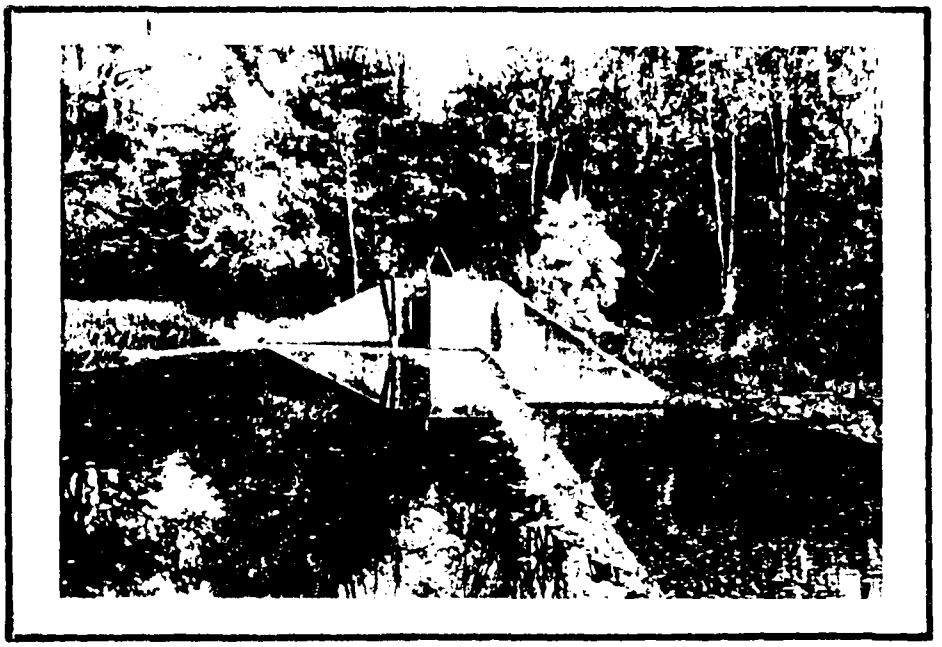
RIGHT EMBANKMENT FROM RIGHT ABUTMENT - NO. 3



DOWNSTREAM FACE OF WEIR - NO. 4



DOWNSTREAM SIDE OF OUTLET IN LEFT ABUTMENT WALL - NO. 5



LEFT SIDE OF SPILLWAY AND ABUTMENT - NO. 6

DOWNSTREAM CHANNEL - NO. 7

PA-00612
Plate C-IV

APPENDIX D

HYDROLOGY AND HYDRAULIC CALCULATIONS

SUMMARY DESCRIPTION
OF
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION

The hydrologic and hydraulic evaluation for this inspection report has employed computer techniques using the Corps of Engineers computer program identified as the Flood Hydrograph Package (HEC-1) Dam Safety Version.

The program has been designed to enable the user to perform two basic types of hydrologic analyses: (1) the evaluation of the overtopping potential of the dam, and (2) the capability to estimate the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. A brief summary of the computation procedures typically used in the dam overtopping analysis is shown below.

- Development of an inflow hydrograph to the reservoir.
- Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.
- Routing of the outflow hydrograph(s) of the reservoir to desired downstream locations. The results provide the peak discharge and maximum stage of each routed hydrograph at the outlet of the reach.

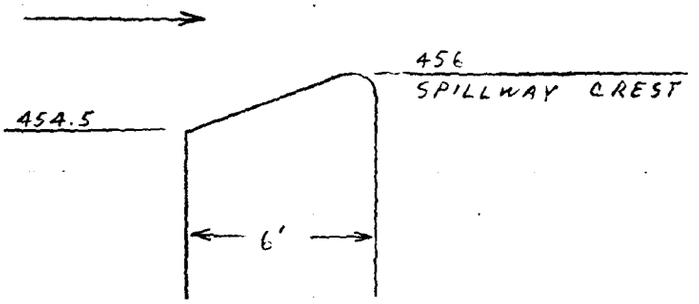
The output data provided by this program permits the comparison of downstream conditions just prior to a breach failure with that after a breach failure and the determination as to whether or not there is a significant increase in the hazard to loss of life as a result of such a failure.

The results of the studies conducted for this report are presented in Section 5.

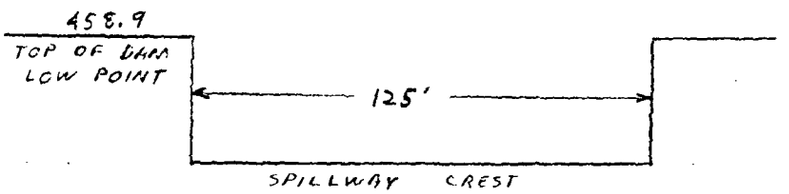
For detailed information regarding this program refer to the Users Manual for the Flood Hydrograph Package (HEC-1) Dam Safety Version prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California.

BY RLS DATE 12/5/90 **BERGER ASSOCIATES** SHEET NO. 1 OF 4
CHKD. BY ____ DATE ____ PROJECT D0590
SUBJECT HEILMAN DAM

SPILLWAY RATING



BROAD CRESTED WEIR
C = 3.3 (KING'S HOBK)



$Q = C L H^{3/2}$

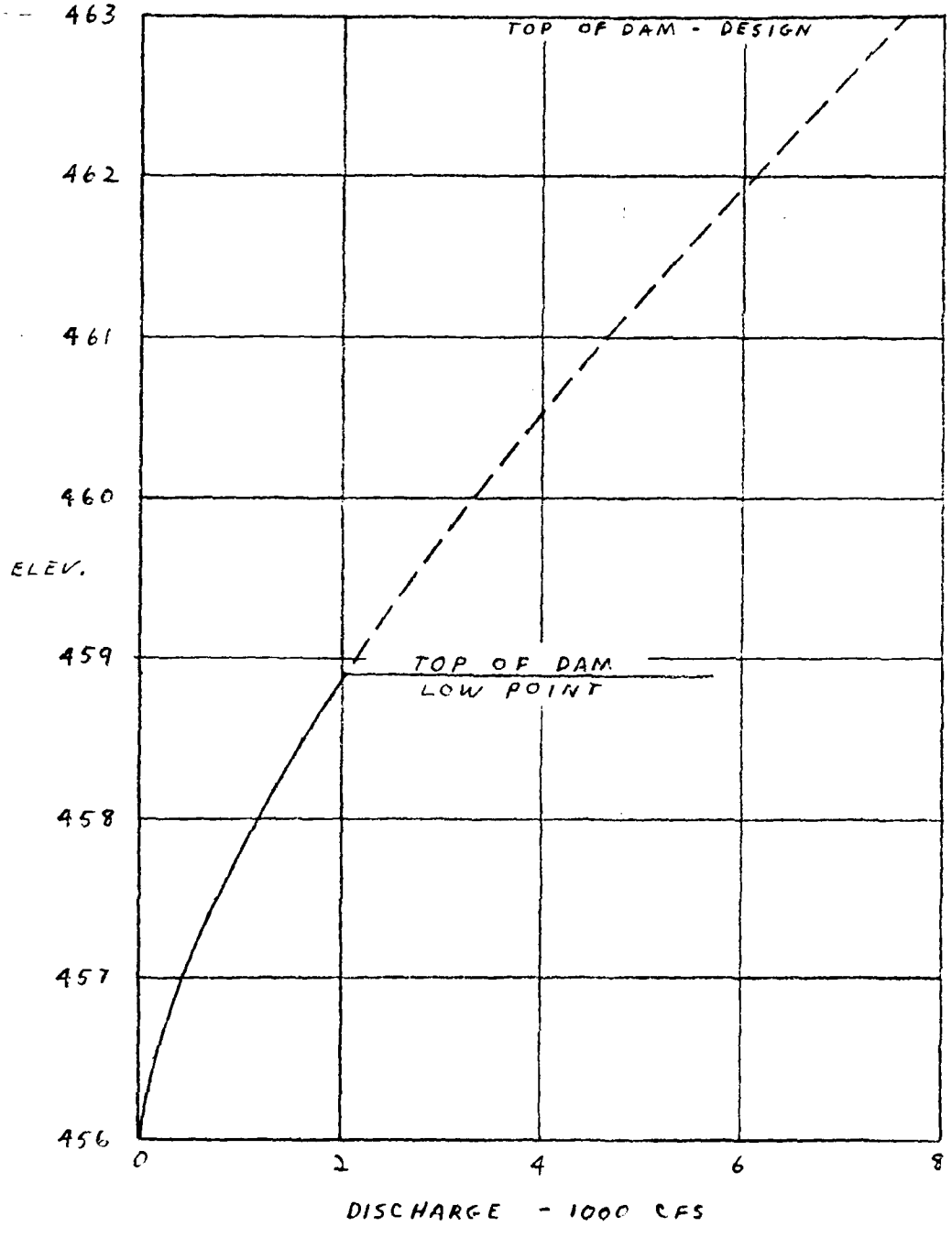
$H = 458.9 - 456 = 2.9'$

$Q = 3.3 \times 125 \times (2.9)^{1.5}$

$= 2037$ CFS

BY RLS DATE 12/8/82 **BERGER ASSOCIATES** SHEET NO. 2 OF 9
CHKD. BY DATE PROJECT D0590
SUBJECT HEILMAN DAM

SPILLWAY RATING CURVE



BY RLS DATE 12/8/80 | BERGER ASSOCIATES | SHEET NO. 3 OF 9
CHKD. BY DATE | PROJECT D0590
SUBJECT HEILMAN DAM

DISCHARGE THROUGH OUTLET WORKS

4'x4' SLUICEWAY WITH 48" GATE

INVERT ELEV. = 449

C = 0.6 (KING'S HDBK)

$Q = CA\sqrt{2gH}$

AT POOL ELEV 456

$H = 456 - 451 = 5'$

$Q = 0.6 \times 4 \times 4 \times (2 \times 32.2 \times 5)^{0.5}$

= 172 CFS

AT LOW POOL ELEV 453.5

$H = 453.5 - 451 = 2.5'$

$Q = 0.6 \times 4 \times 4 \times (2 \times 32.2 \times 2.5)^{0.5}$

= 122 CFS

BY RLS DATE 12/5/80 **BERGER ASSOCIATES** SHEET NO. 4 OF 9
CHKD. BY DATE PROJECT DO 590
SUBJECT HEILMAN DAM

EMBANKMENT RATING

$Q = CLH^{3/2}$ $C = 2.7$ (KINGS HDBK)

AT ELEV. 460

$2.7 \times 4 \times (.95)^{1.5} = 10$

$2.7 \times 1 \times (.4)^{1.5} = 1$ $\Sigma = 11$ CFS

AT ELEV. 461

$2.7 \times 4 \times (1.95)^{1.5} = 29$

$2.7 \times 2 \times (.9)^{1.5} = 5$

$2.7 \times 2 \times (.25)^{1.5} = 1$ $\Sigma = 35$ CFS

AT ELEV 462

$2.7 \times 4 \times (2.95)^{1.5} = 55$

$2.7 \times 3 \times (1.7)^{1.5} = 18$

$2.7 \times 5 \times (.3)^{1.5} = 2$

$2.7 \times 5 \times (.75)^{1.5} = 9$ $\Sigma = 84$ CFS

AT ELEV 463

$2.7 \times 4 \times (3.95)^{1.5} = 85$

$2.7 \times 3 \times (2.7)^{1.5} = 36$

$2.7 \times 10 \times (1)^{1.5} = 27$

$2.7 \times 20 \times (.25)^{1.5} = 7$

$2.7 \times 25 \times (.2)^{1.5} = 6$

$2.7 \times 19 \times (.15)^{1.5} = 3$

$2.7 \times 10 \times (.25)^{1.5} = 3$

$2.7 \times 18 \times (.35)^{1.5} = 10$

$2.7 \times 21 \times (.1)^{1.5} = 2$

$2.7 \times 5 \times (1.7)^{1.5} = 30$

$2.7 \times 17 \times (.5)^{1.5} = 16$

$2.7 \times 25 \times (.1)^{1.5} = 2$

$2.7 \times 15 \times (.6)^{1.5} =$ $\Sigma = 227$ CFS

AT ELEV 464 $\Sigma = 1081$ CFS

AT ELEV 466 $\Sigma = 4359$ CFS

AT ELEV 468 $\Sigma = 9269$ CFS

MAXIMUM KNOWN FLOOD AT DAMSITE

THERE ARE NO RECORDS OF POOL LEVELS FOR THIS DAM. BASED ON THE RECORDS OF THE GAGING STATION FOR WILD CREEK AT NEARBY HATCHERY, PA. (D.A. = 16.8 SQ.MI) THE MAXIMUM DISCHARGE AT THE GAGE OCCURRED IN MAY 1942 WHEN A DISCHARGE OF 2360 CFS WAS OBSERVED. THE MAXIMUM INFLOW TO HEILMAN DAM IS ESTIMATED TO BE:

$$Q = \left(\frac{38.5}{16.8}\right)^{0.8} \times 2360$$

$$= 4582 \text{ CFS}$$

DESIGN FLOOD

SIZE CLASSIFICATION

MAXIMUM STORAGE = 117 ACRE-FEET
MAXIMUM HEIGHT = 15 FEET
SIZE CLASSIFICATION IS "SMALL"

HAZARD CLASSIFICATION

SEWAGE TREATMENT PLANT IS LOCATED DOWNSTREAM OF THE DAM.
USE "SIGNIFICANT"

RECOMMENDED SPILLWAY DESIGN FLOOD

THE ABOVE CLASSIFICATIONS INDICATE USE OF AN SDF EQUAL TO THE 100 YR FLOOD TO ONE-HALF THE PROBABLE MAXIMUM FLOOD.

100 YR FLOOD

REF: "REGIONAL FREQUENCY STUDY, UPPER DELAWARE AND HUDSON RIVER BASINS, NEW YORK DISTRICT U.S. ARMY, CORPS OF ENGINEERS, HEC."

HEILMAN DAM D.A. = 38.5 SQ. MI.

(FIG. 2) CM = 1.65

$LOG(Q_m) = CM + 0.87\ LOG(A)$

$= 1.65 + 0.87\ LOG(38.5)$

$= 3.0294$

(FIG. 3) $C_s = .41$

$S = C_s - 0.05\ LOG(A)$

$= .41 - 0.05\ LOG(38.5)$

$= .331$

(FIG. 5) SKEW = +.45

(TABLE 10) STANDARD DEVIATE = 2.6506

$LOG(Q(P)) = LOG(Q_m) + K(P, g)\,S$

$= 3.0294 + (2.6506)(.331)$

$= 3.9067$

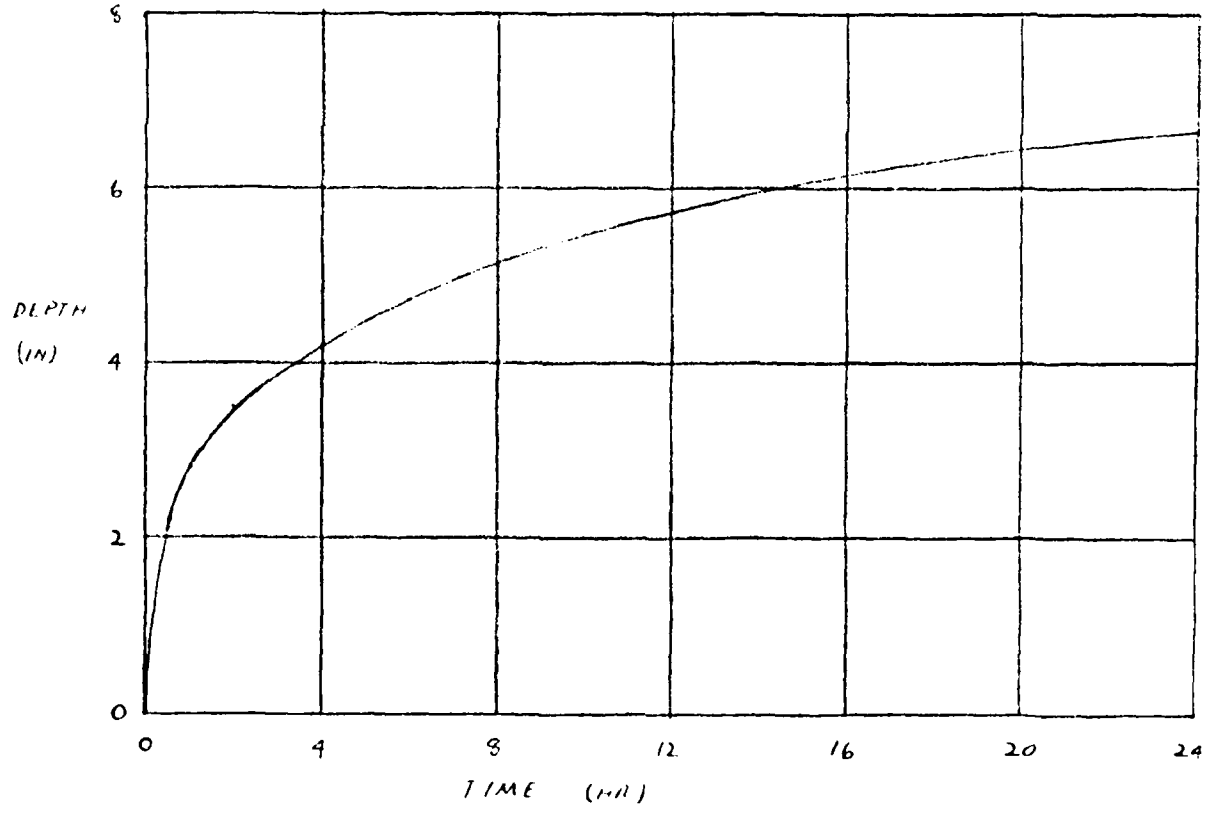
$Q_1 = 8067$ CFS

BY RLS DATE 12/9/80 | BERGER ASSOCIATES | SHEET NO. 1 OF 4
CHKD. BY ____ DATE ____ | PROJECT D059C
SUBJECT HEILMAN DAM

100 YR FLOOD (CONT)

TOTAL RAINFALL (FROM TP-40)

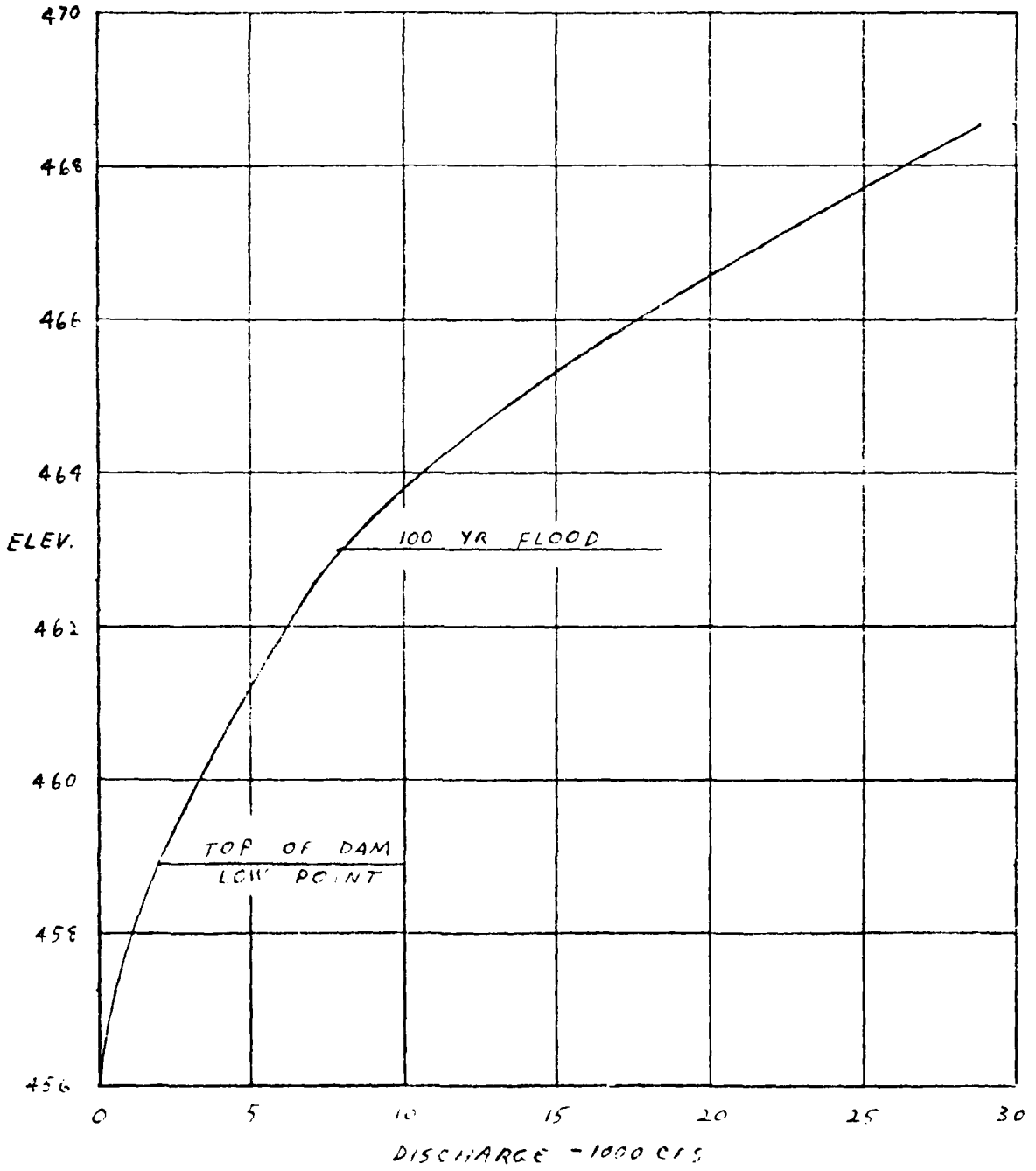
DURATION (HR.)	DEPTH (IN)
.5	2.22
1	2.83
2	3.5
3	3.85
6	4.72
12	5.72
24	6.67



$Q_{100} = 7886$ CFS — 80(.)

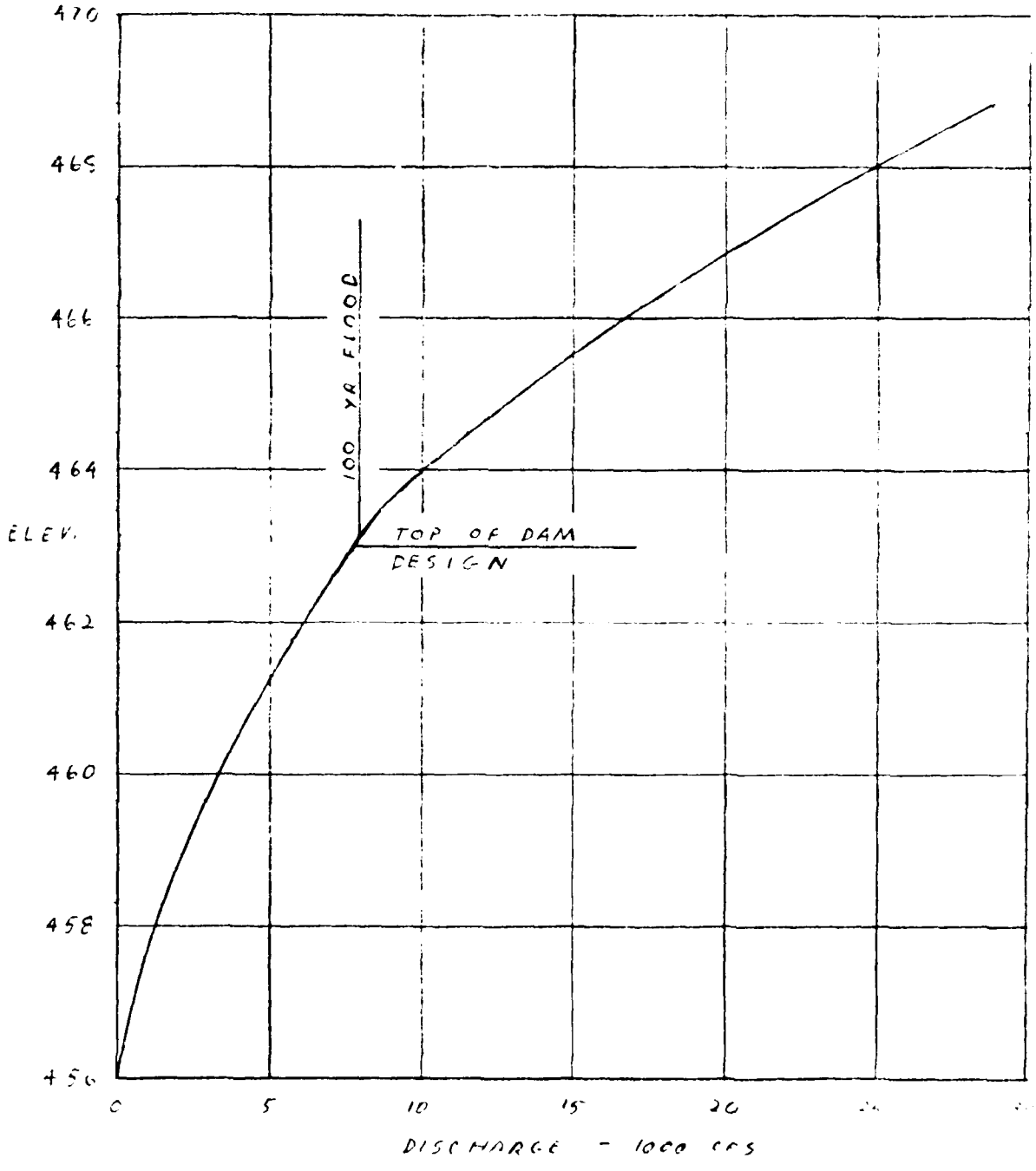
BY RLS DATE 11/23/81 **BERGER ASSOCIATES** SHEET NO. 8 OF 9
CHKD. BY DATE PROJECT 00590
SUBJECT HEILMAN DAM

SPILLWAY CAPACITY CURVE



BY RLS DATE 1/26/81 BERGER ASSOCIATES SHEET NO. 1 OF 1
CHKD. BY DATE PROJECT 0190
SUBJECT HILLMAN DAM

SPILLWAY CAPACITY CURVE (DESIGN)



HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: Heilman Dam RIVER BASIN: Delaware

PROBABLE MAXIMUM PRECIPITATION (PMP) = 22.6 INCHES/24 HOURS[1]

(FOR FOOTNOTES SEE NEXT PAGE)

STATION		1	2	3	4
STATION DESCRIPTION		Reservoir	Dam		
DRAINAGE AREA (SQUARE MILES)		38.5			
CUMULATIVE DRAINAGE AREA (SQUARE MILE)		38.5	38.5		
ADJUSTMENT OF PMP FOR DRAINAGE AREA (%)[2]	6 HOURS	100			
	12 HOURS	109			
	24 HOURS	119			
	48 HOURS	131			
	72 HOURS	---			
	Zone 6				
SNYDER HYDROGRAPH PARAMETERS	ZONE[3]	2			
	C_p/C_t[4]	.45/2.1			
	L (MILES)[5]	16.88			
	L_{ca} (MILES)[5]	8.91			
	$T_p=C_t(L_{ca})^{0.6}$[9] (Hours)	7.80			
SPILLWAY DATA	CREST LENGTH (FT.)		125		
	FREEBOARD (FT.)		2.9		
	DISCHARGE COEFFICIENT		3.3		
	EXPONENT		1.5		
	ELEVATION		456		
AREA[6] (ACRES)	NORMAL POOL 456	4.6			
	ELEV. 460	39.5			
	ELEV 480	157.9			
STORAGE (ACRE-FEET)	NORMAL POOL[7]	76.7			
	ELEV 406[8]	0			
	ELEV [8]				
	ELEV [8]				

(1) Hydrometeorological Report 33 (Figure 1), U.S. Army, Corps of Engineers, 1956.

(2) Hydrometeorological Report 33 (Figure 2), U.S. Army, Corps of Engineers, 1956.

(3) Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficients (C_p and C_t).

(4) Snyder's Coefficients.

(5) L = Length of longest water course from outlet to basin divide.

L_{ca} = Length of water course from outlet to point opposite the centroid of drainage area.

(6) Planimetered area encompased by contour upstream of dam.

(7) PennDER files.

(8) Computed by conic method.

(9) Snyder Equation.

```
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  01 APR 80
**********************************
    1             A1      HEILMAN DAM    ****    MAHONING CREEK
    2             A2      BOROUGH OF LEHIGHTON, CARBON COUNTY, PA.
    3             A3      NDI # PA-00612      PA DER # 13-5
    4             B    300       0      15       0       0       0       0       0      -4       0
    5             B1     5
    6             J      1       1       1
    7             J1     1
    8             K              1                                               1
    9             K1                INFLOW  HYDROGRAPH
   10             M              1    38.5
   11             O     96
   12             O1   .01     .01     .01     .01     .01     .01     .01     .01     .02     .02
   13             O1   .02     .02     .02     .02     .02     .02     .02     .03     .03     .03
   14             O1   .03     .03     .03     .03     .03     .04     .04     .04     .04     .04
   15             O1   .04     .04     .04     .05     .05     .06     .06     .06     .06     .07
   16             O1   .08     .09     .10     .11     .16     .20     .33    1.55     .67     .28
   17             O1   .18     .13     .11     .09     .09     .07     .07     .06     .06     .06
   18             O1   .05     .05     .05     .04     .04     .04     .04     .04     .04     .04
   19             O1   .04     .03     .03     .03     .03     .03     .03     .03     .02     .02
   20             O1   .02     .02     .02     .02     .02     .02     .02     .01     .01     .01
   21             O1   .01     .01     .01     .01     .01     .01
   22             T                                                       .01     .01
   23             W   7.80     .45
   24             X   -1.5    -.05       2
   25             K      1       2                                               1
   26             K1               RESERVOIR  ROUTING
   27             Y                               1
   28             Y1     1                                                 76.7      -1
   29             Y4   456   456.5     457   457.5     458   458.5   458.9   459.5     460     461
   30             Y4   462     463     464
   31             Y5     0     146     413     758    1167    1631    2037    2704    3311    4047
   32             Y5  6146    7867   10414
   33             $A     0     4.6    39.5   157.9
   34             $E   406     456     460     480
   35             $$   456
   36             QD 458.9
   37             K     99
1                          PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                RUNOFF HYDROGRAPH AT          1
                                ROUTE HYDROGRAPH TO           2
                                END OF NETWORK


1**********************************
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION     JULY 1978
   LAST MODIFICATION  01 APR 80
**********************************

 RUN DATE= 91/01/23.
      TIME= 05.52.46.


                        HEILMAN DAM    ****    MAHONING CREEK
                        BOROUGH OF LEHIGHTON, CARBON COUNTY, PA.
                        NDI # PA-00612      PA DER # 13-5
```

HEILMAN DAM **** MAHONING CREEK
BOROUGH OF LEHIGHTON, CARBON COUNTY, PA.
NDI # PA-00612 PA DER # 13-5

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	15	0	0	0	0	0	-4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 1 LRTIO= 1

RTIOS= 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	1	38.50	0.00	38.50	0.00	0.000	0	0	0

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	.01	.01	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 7.80 CP= .45 NTA= 0

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 100 END-OF-PERIOD ORDINATES, LAG= 7.33 HOURS, CP= .45 VOL= .82

8.	30.	62.	101.	146.	196.	250.	307.	367.	430.
496.	564.	634.	706.	780.	855.	931.	1003.	1070.	1133.
1192.	1245.	1294.	1339.	1378.	1412.	1441.	1464.	1481.	1491.
1493.	1484.	1461.	1431.	1403.	1374.	1347.	1320.	1293.	1267.
1241.	1216.	1192.	1168.	1144.	1121.	1099.	1077.	1055.	1034.
1013.	993.	973.	953.	934.	915.	897.	879.	861.	843.
826.	810.	794.	778.	762.	747.	732.	717.	702.	688.
674.	661.	647.	634.	622.	609.	597.	585.	573.	562.
550.	539.	528.	518.	507.	497.	487.	477.	468.	458.
449.	440.	431.	422.	414.	406.	397.	389.	382.	374.

0 END-OF-PERIOD FLOW
MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q

SUM 6.67 6.42 .25 523144.
(169.)(163.)(6.)(14813.79)

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

RESERVOIR ROUTING

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	0	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	77.	-1

STAGE	456.00	456.50	457.00	457.50	458.00	458.50	458.90	459.50	460.00	461.00
	462.00	463.00	464.00							
FLOW	0.00	146.00	413.00	758.00	1167.00	1631.00	2037.00	2704.00	3311.00	4647.00
	6146.00	7867.00	10414.00							
SURFACE AREA=	0.	5.	40.	158.						
CAPACITY=	0.	77.	153.	1996.						
ELEVATION=	406.	456.	460.	480.						

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
456.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
458.9	0.0	0.0	0.

PEAK OUTFLOW IS 7852. AT TIME 20.00 HOURS

1

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

				RATIOS APPLIED TO FLOWS
OPERATION	STATION	AREA	PLAN	RATIO 1
				1.00
HYDROGRAPH AT	1	38.50	1	7836.
		(99.71)		(223.31)(
ROUTED TO	2	38.50	1	7852.
		(99.71)		(222.35)(

1 SUMMARY OF DAM SAFETY ANALYSIS

*********** *********** *********** *********** ***********

1

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 1.00
HYDROGRAPH AT	1	38.50 (99.71)	1	7886. (223.31)(
ROUTED TO	2	38.50 (99.71)	1	7852. (222.35)(

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	456.00	456.00	458.90
STORAGE	77.	77.	117.
OUTFLOW	1.	0.	2037.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	462.99	4.09	290.	7852.	23.25	20.00	0.00

EOI ENCOUNTERED.
N>

```
1**********************************
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION     JULY 1978
   LAST MODIFICATION  01 APR 80
 **********************************
    1            A1      HEILMAN DAM    ****    MAHONING CREEK
    2            A2      BOROUGH OF LEHIGHTON, CARBON COUNTY, PA.
    3            A3      NDI # PA-00612      PA DER # 13-5
    4            B    300      0      15       0       0       0       0       0      -4       0
    5            B1     5
    6            J      1       1       1
    7            J1     1
    8            K              1                                               1
    9            K1                INFLOW  HYDROGRAPH
   10            M              1    38.5
   11            O     96
   12            O1   .01     .01     .01     .01     .01     .01     .01     .01     .02     .02
   13            O1   .02     .02     .02     .02     .02     .02     .02     .03     .03     .03
   14            O1   .03     .03     .03     .03     .03     .04     .04     .04     .04     .04
   15            O1   .04     .04     .04     .05     .05     .06     .06     .06     .06     .07
   16            O1   .08     .09     .10     .11     .16     .20     .33    1.55     .67     .28
   17            O1   .18     .13     .11     .09     .09     .07     .07     .06     .06     .06
   18            O1   .05     .05     .05     .04     .04     .04     .04     .04     .04     .04
   19            O1   .04     .03     .03     .03     .03     .03     .03     .03     .02     .02
   20            O1   .02     .02     .02     .02     .02     .02     .02     .01     .01     .01
   21            O1   .01     .01     .01     .01     .01     .01
   22            T                                                       .01     .01
   23            W   7.80     .45
   24            X   -1.5    -.05       2
   25            K      1       2                                               1
   26            K1               RESERVOIR  ROUTING
   27            Y                                1
   28            Y1     1                                                 76.7
   29            $A     0     4.6    39.5   157.9
   30            $E   406     456     460     480
   31            $$   456     125     3.3     1.5
   32            $D   463     2.7     1.5     260
   33            K     99
1                        PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                              RUNOFF HYDROGRAPH AT          1
                              ROUTE HYDROGRAPH TO           2
                              END OF NETWORK

1**********************************
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION     JULY 1978
   LAST MODIFICATION  01 APR 80
 **********************************

 RUN  DATE= 81/01/22.
      TIME= 13.43.00.

                    HEILMAN DAM    ****    MAHONING CREEK
                    BOROUGH OF LEHIGHTON, CARBON COUNTY, PA.
                    NDI # PA-00612      PA DER # 13-5

                                   JOB SPECIFICATION
          NQ     NHR    NMIN    IDAY     IHR    IMIN   METRC    IPLT    IPRT   NSTAN
         300       0      15       0       0       0       0       0      -4       0
                            JOPER     NVT   LPRPT   TRACE
```

HEILMAN DAM **** MAHONING CREEK
BOROUGH OF LEHIGHTON, CARBON COUNTY, PA.
NDI # PA-00612 PA DER # 13-5

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	15	0	0	0	0	0	-4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 1 LRTIO= 1

RTIOS= 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	1	38.50	0.00	38.50	0.00	0.000	0	0	0

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	.01	.01	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 7.80 CP= .45 NTA= 0

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES, LAG= 7.83 HOURS, CP= .45 VOL= .82

8.	30.	62.	101.	146.	196.	250.	307.	367.	430.
496.	564.	634.	706.	780.	855.	931.	1003.	1070.	1133.
1192.	1245.	1294.	1339.	1378.	1412.	1441.	1464.	1481.	1491.
1493.	1484.	1461.	1431.	1403.	1374.	1347.	1320.	1293.	1267.
1241.	1216.	1192.	1168.	1144.	1121.	1099.	1077.	1055.	1034.
1013.	993.	973.	953.	934.	915.	897.	879.	861.	843.
826.	810.	794.	778.	762.	747.	732.	717.	702.	688.
674.	661.	647.	634.	622.	609.	597.	585.	573.	562.
550.	539.	528.	518.	507.	497.	487.	477.	468.	458.
449.	440.	431.	422.	414.	406.	397.	389.	382.	374.

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q

SUM 6.67 6.42 .25 223144.
(169.3 163.0 6.3)(6318813.7M)

********** ********** ********** ********** **********

RESERVOIR ROUTING

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	0	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	77.	0

SURFACE AREA=	0.	5.	40.	158.
CAPACITY=	0.	77.	153.	1996.
ELEVATION=	406.	456.	460.	480.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
455.0	125.0	3.3	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
463.0	2.7	1.5	260.

PEAK OUTFLOW IS 7857. AT TIME 20.00 HOURS

********** ********** ********** ********** **********

1

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1
				1.00
HYDROGRAPH AT	1	38.50	1	7896.
		(99.71)		(223.31)(
ROUTED TO	2	38.50	1	7857.
		(99.71)		(222.46)(

RATIOS APPLIED TO FLOWS

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

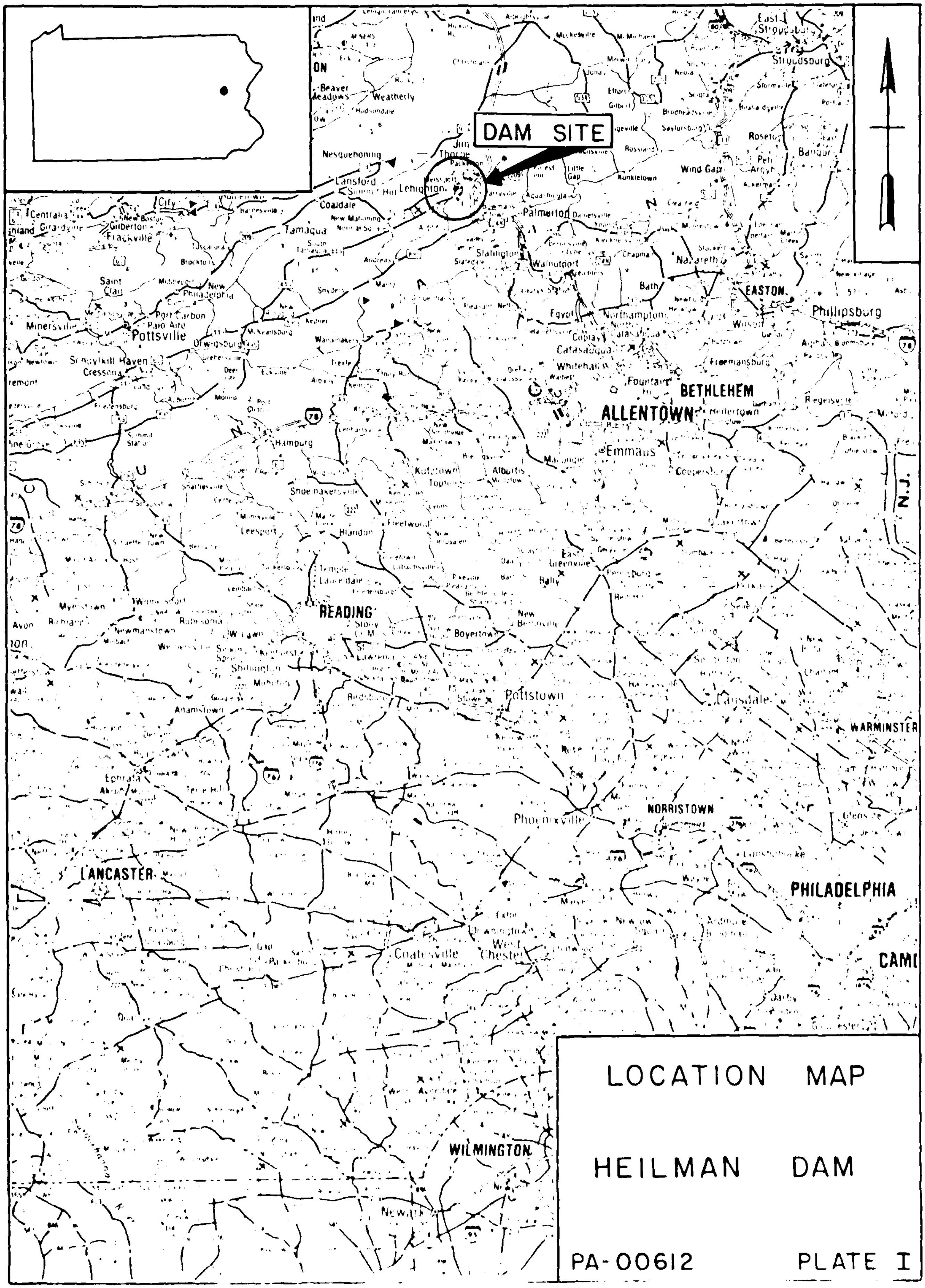
	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	456.00	456.00	463.00
STORAGE	77.	77.	291.
OUTFLOW	0.	0.	7640.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	463.12	.12	297.	7857.	2.00	20.00	0.00

EOI ENCOUNTERED.

APPENDIX E

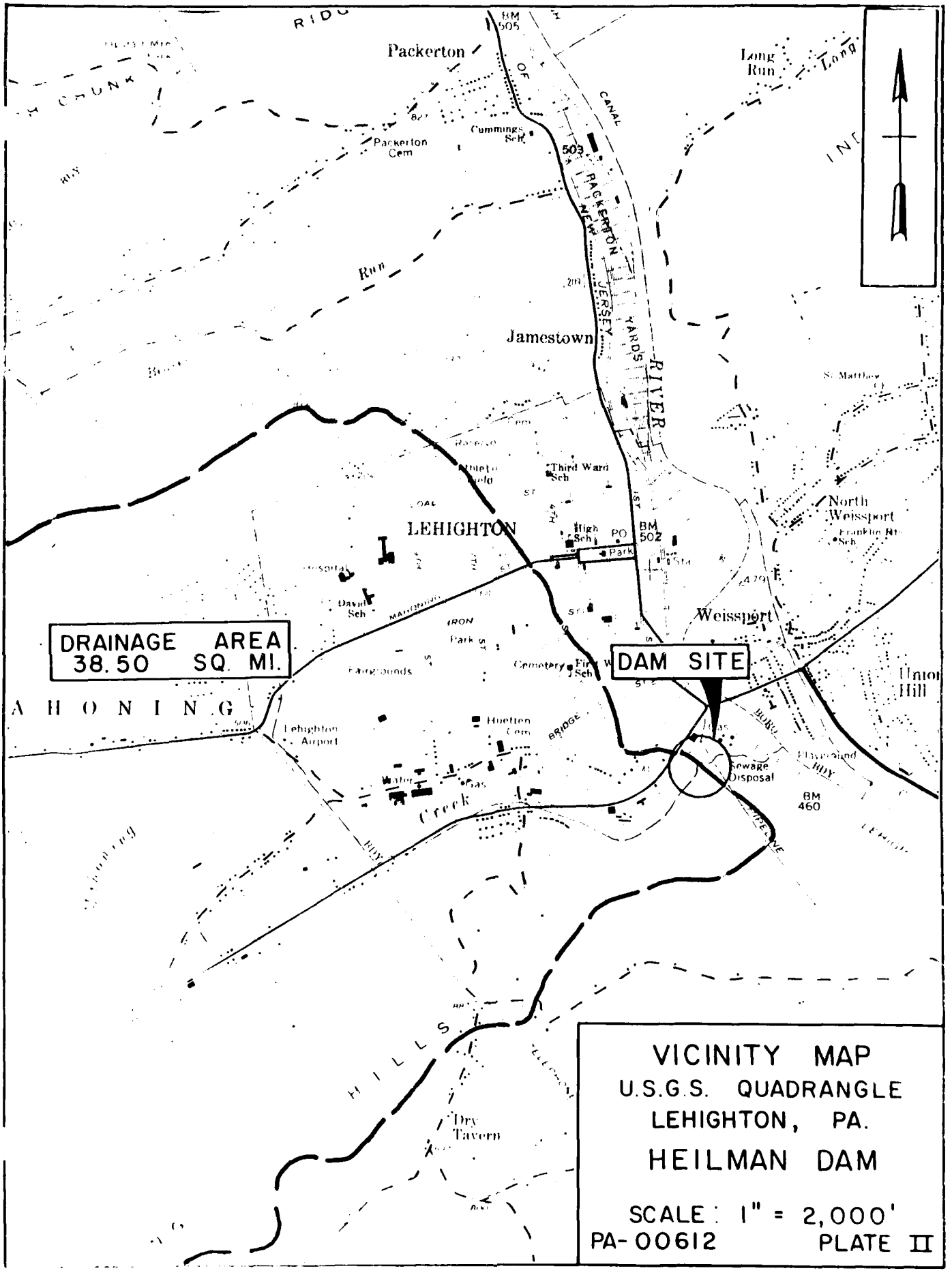
PLATES



LOCATION MAP

HEILMAN DAM

PA-00612 PLATE I

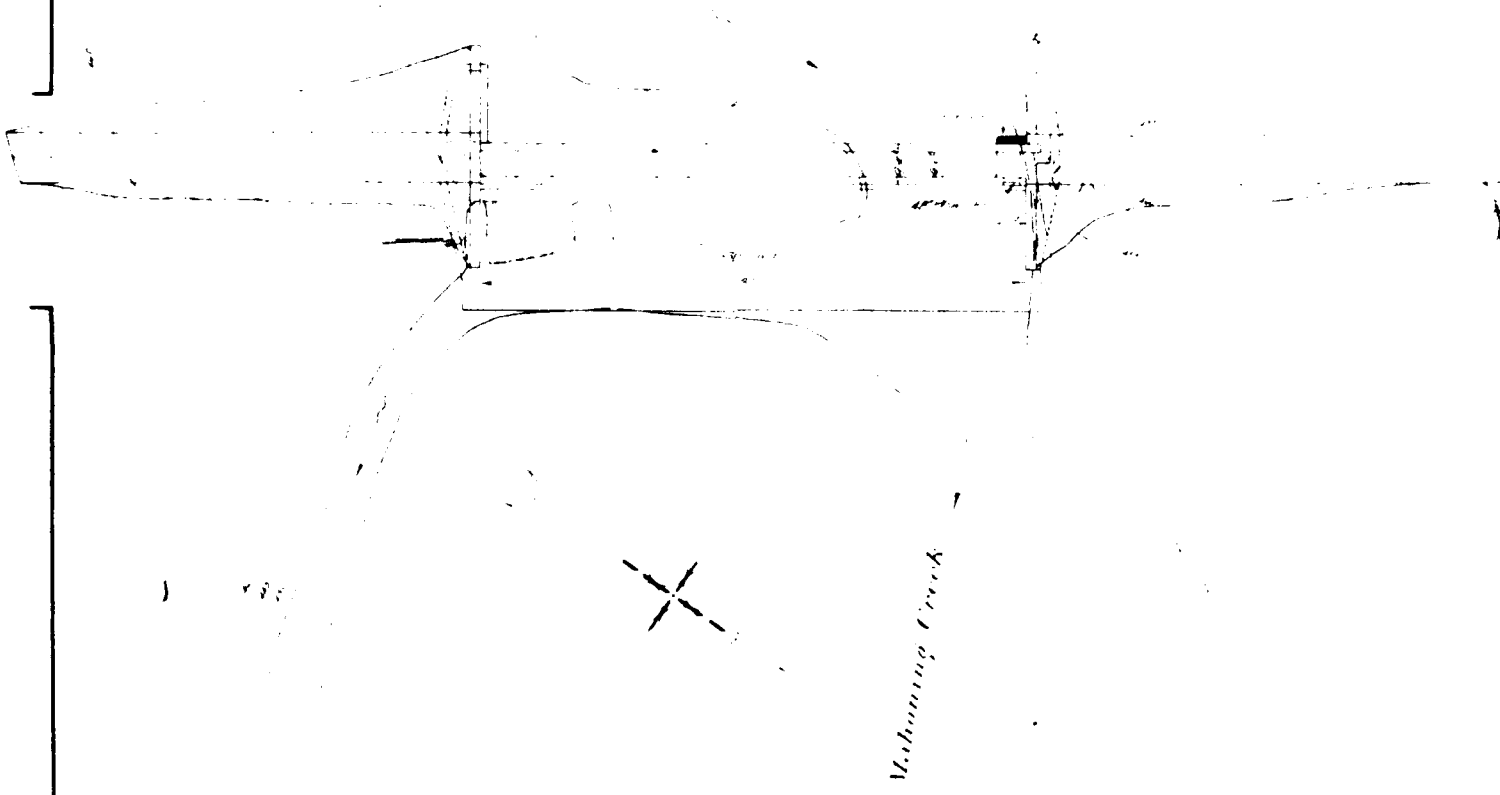


VICINITY MAP
U.S.G.S. QUADRANGLE
LEHIGHTON, PA.

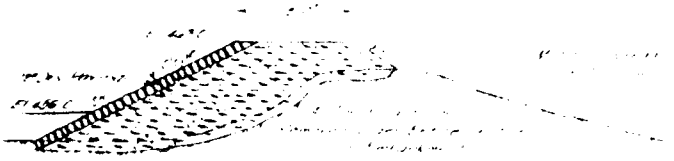
HEILMAN DAM

SCALE: 1" = 2,000'

PA-00612 PLATE II

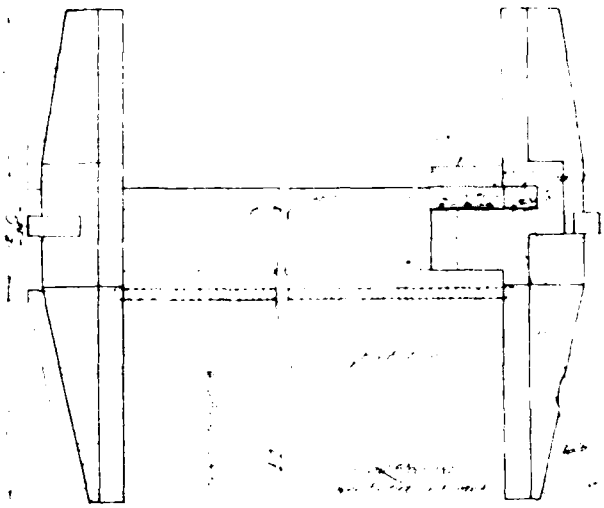


GENERAL PLAN

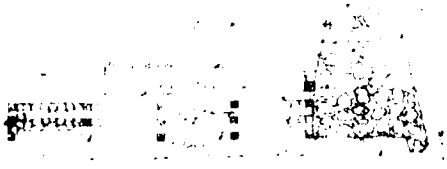


TYPICAL SECTION OF EMBANKMENT

DOWN-STREAM ELEVATION



PLAN



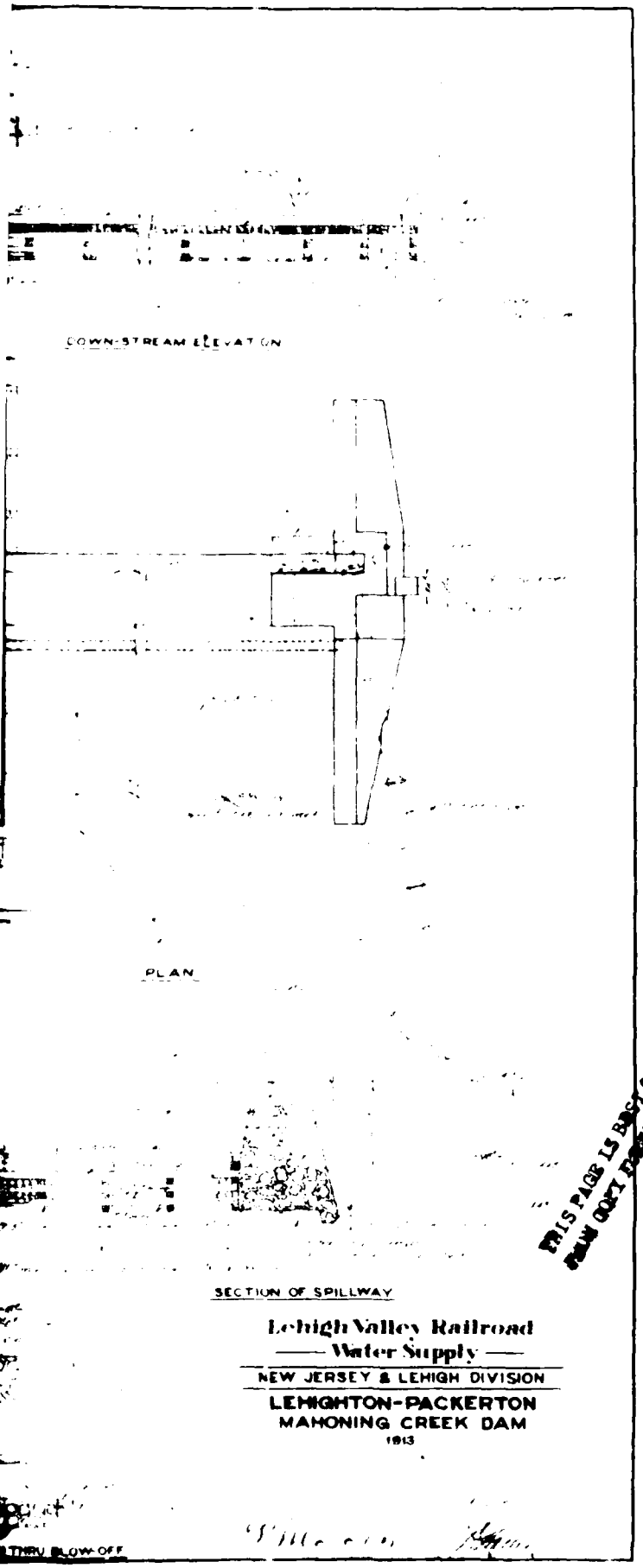
SECTION OF SPILLWAY

SECTION THRU BLOW OFF

Lehigh Valley Railroad
Water Supply

NEW JERSEY & LEHIGH DIVISION

LEHIGHTON-PACKERTON
MAHONING CREEK DAM
1913



PA-00612
PLATE III

APPENDIX F

GEOLOGIC REPORT

BEDROCK - DAM AND RESERVOIR

This area overlies two formations; the Mahantango and Trimmers Rock Formations. The majority of the dam covers the Trimmers Rock Formation which consists of massive and fissile siltstones and shales.

STRUCTURE

There is an apparent minor fault striking the SE corner of the dam approximately N77°E. This follows the average structural grain trend of N75°E. Fractures and joints are well developed and closely spaced in the siltstones. The dip ranges between 45° vertical.

OVERBURDEN

The overburden in this area consists primarily of alluvium and floodplain deposits originating from the Lehigh River and Mahoning Creek. Silts, sands and gravels are common.

AQUIFER CHARACTERISTICS

The Trimmers Rock Formation is a fair to good aquifer with a low interstitial porosity in the coarser rocks. The possibility of subsurface seepage exists, but the extent depends on the localized lithology and if the fault actually exists.

DISCUSSION

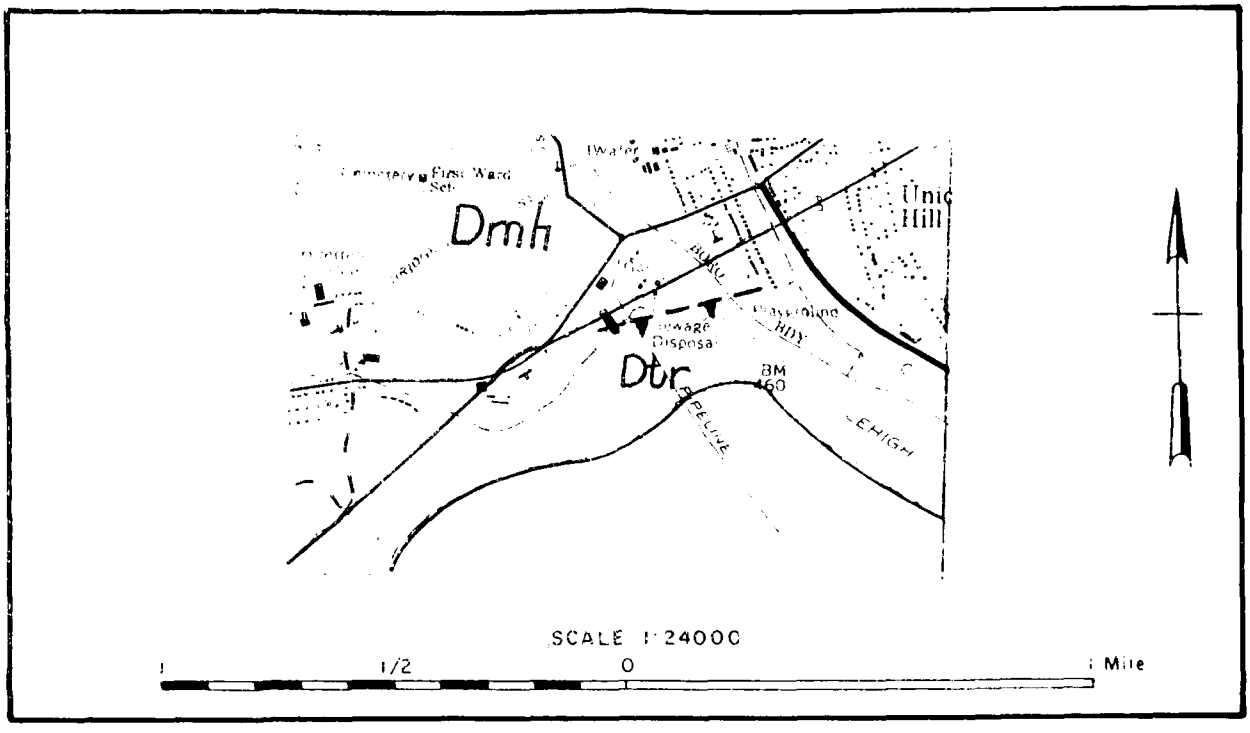
According to available construction plans, the dam rests on bedrock. If such is the case, the Trimmers Rock Formation shouls provide a good quality foundation for heavy structures.

SOURCES OF INFORMATION

1. Epstein, J.B., et. al., 1974. Geology and Mineral Resources of the Lehighton and Palmerton Quadrangles, Carbon and Northampton Counties, Pennsylvania: Pennsylvania Geological Survey A-195cd.

2. McGlade, W.G., et. al., 1972. Engineering Characteristics of the Rocks of Pennsylvania: Pennsylvania Geological Survey EG-1.

GEOLOGIC MAP - HEILMAN DAM



LEGEND

Dtr — Trimmers Rock Formation

Dmh — Mahantango Formation

Apparent Minor Fault